

CALIPSO

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National Aeronautics and Space Administration
Langley Research Center



Centre National d'Etudes Spatiales

NASA/CNES CALIPSO PROJECT SAFETY PLAN

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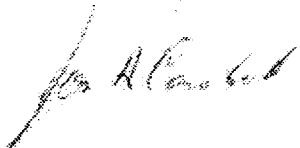
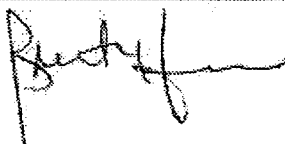

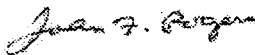

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REVISION HISTORY TABLE

Revision	Date	Description
Version 0.0	2 Aug 00	Initial Document for review
Version 0.1	29 Nov 00	Updated Document from OMA tabletop review
Version 0.2	9 Feb 01	Update document for consistency with other project documents
Version 0.3		Initial Issue
Version 0.4	1 Oct 01	Revision Based on Project Office Comments
Version 0.5	12 Dec 01	Revision Based on CALIPSO Project Office Comments
Version 1.0	12 Dec 02	Revision Based on CNES/ALCATEL and NASA LaRC Comments

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1 INTRODUCTION

Flight hardware and software systems developers for CALIPSO shall implement a System Safety Program in accordance with the requirements imposed by the VAFB launch range, NASA, and the launch vehicle manufacturer or launch service provider. This plan provides an approach to meet these requirements. Any tailoring of CALIPSO requirements will be done only with concurrence of the applicable launch range safety organization.

The requirements contained in this document are mandatory compliance requirements for CALIPSO hardware and software. The Project Manager will ensure compliance with the requirements and certify to the launch range, in the form of the Missile System Pre-launch Safety Data Package (MSPSP), that all of the requirements have been met.

1.1 BACKGROUND

The CALIPSO mission is an element of the Earth System Science Pathfinders (ESSP) program led by Goddard Space Flight Center (GSFC). CALIPSO is a joint venture between NASA, the French Centre National d'Etudes Spatiales (CNES), Hampton University (HU), the Institute Pierre Simon Laplace (IPSL) and Ball Aerospace & Technologies Corporation (BATC) and is managed by Langley Research Center (LaRC). Ball Aerospace & Technologies Corporation (BATC) is the prime contractor for the U.S. payload components of the satellite segment. ALCATEL is the prime contractor for the CNES provided platform and satellite engineering effort. SODERN is the prime contractor for the Imaging Infrared Radiometer (IIR) instrument. Kennedy Space Center (KSC) will handle the launch vehicle and operations contract. The mission launch is scheduled for 2004 on a Delta II launch vehicle from VAFB. The satellite consists of the payload of three instruments and their support elements (computer, data storage, telemetry and structure) and the platform PROTEUS (Plateforme Reconfigurable pour l'Observation, les Telecommunications, et les Usages Scientifiques), built by ALCATEL for CNES. The ground segment includes LaRC Mission Operations Control Center and Payload Data Delivery System; and CNES Satellite Operations Ground System. The science segment includes LaRC science data management, the French data site provided by the Institute Pierre Simon Laplace and Hampton University implementation of algorithms.

The spacecraft is being developed with the overall objective to be free of conditions, both in design and operations that could produce uncontrolled hazards for ground personnel, the Launch Vehicle, Ground Support Equipment, and the general public.

The spacecraft, its relevant Ground Support Equipment at the launch site and Launch Site Operations are being designed in compliance with Safety requirements applicable for a launch at Vandenberg Air Force Base.

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1.2 PURPOSE

The purpose of the Safety Plan is to provide a detailed description of the tasks and activities of the safety management and safety engineering required to identify, evaluate, eliminate and control hazards, or reduce the associated risk to a level acceptable to Range Safety throughout the CALIPSO spacecraft life on ground up to separation from the launcher.

1.3 SCOPE OF DOCUMENT

The Safety Plan provides a basis of understanding between NASA, CNES, their contractors, and Range Safety on how the Safety Program is being conducted to meet the design and operational safety requirements of EWR-127.1

2 REQUIREMENT DOCUMENT

Implementation of the following document is mandatory for the CALIPSO Project. :

EWR –127-1(31 March 1995): Eastern and Western Range Safety Requirements (PROTEUS Platform and original GSE)

EWR –127-1(31 October 1997): Eastern and Western Range Safety Requirements (Changes to the PROTEUS Platform design and original GSE, and for the Payload/Laser and its GSE)

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3 SAFETY RESPONSABILITIES

Each organization is responsible for complying with national, local, and facility safety requirements. Every person is responsible for safety. Individual employees are responsible for adherence to safety requirements, for the implementation of good practices and techniques, and for reporting to their supervisor or to the acting supervisor any condition, existing or anticipated, that they consider hazardous. The following provides an overview of responsibilities.

3.1 ORGANIZATION OF THE SAFETY WORKING GROUP

The CALIPSO Safety Working Group oversees CALIPSO project operations with respect to safety. The CALIPSO Safety Working Group consists of safety representatives from LaRC, CNES, ALCATEL, SODERN, BATC, and GSFC. The working group will review the design and operations safety documentation and review status of milestones. The group will also review interfaces of the subsystems/elements to assure that a system level approach is achieved for safety. Finally the group will review the interfaces of the satellite and the launch vehicle for safety impacts. The group shall meet as needed.

The Safety Working Group will conduct a continuing review of design, component selection, assurance inspections, fabrication, tests plans, test results and design documentation, and finally system preparation for launch operations.

The Safety Working Group is composed of all entities involved in the Satellite Safety Submittal Process:

- LaRC (Payload and chairing of the Safety Working Group)
- CNES / ALCATEL (Satellite)
- GSFC
- KSC (launcher authority)
- Range (VAFB Safety Authority)
- BATC and SODERN (instrument, as needed)

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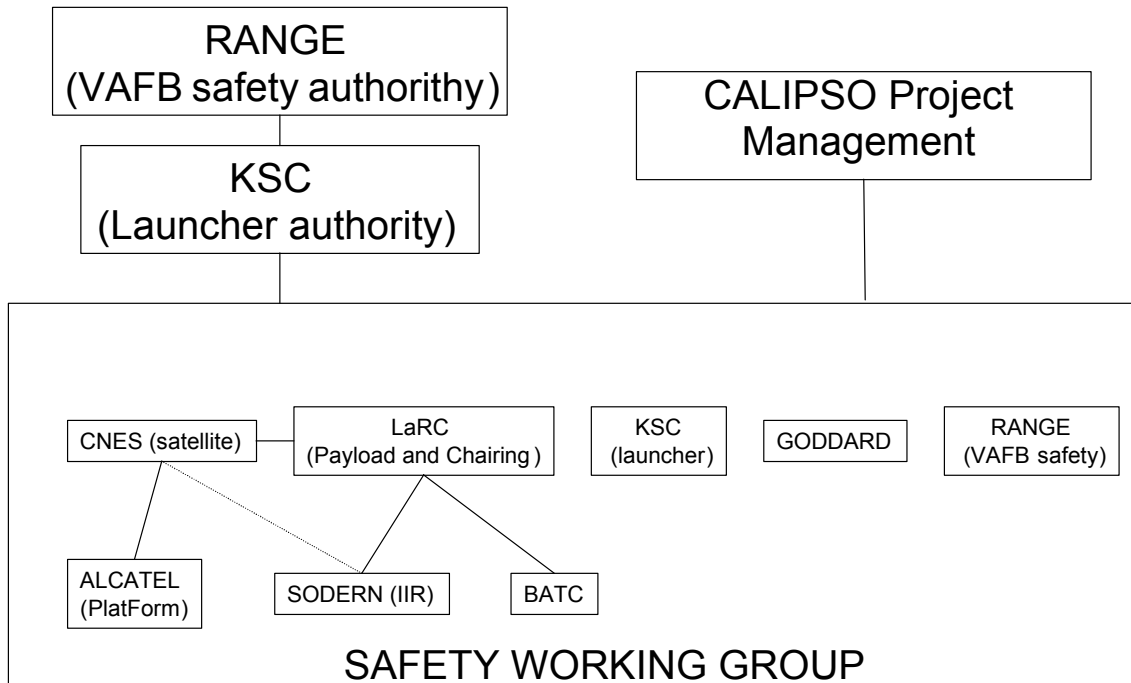
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Figure 1 CALIPSO Safety Organizational Chart



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TABLE 1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES

Organization	Role	Responsibilities
NASA LaRC / CNES	Project Managers	<ul style="list-style-type: none"> • Overall responsibility for safety respective implementation. • Routinely monitor progress of safety respective activities. • Maintain approval authority over all critical project decisions and documentation. • Sign MSPSP, hazard reports, non-compliances, and other safety documentation.
NASA LaRC CNES KSC RANGE GSFC ALCATEL BATC SODERN	Safety Working Group	<ul style="list-style-type: none"> • Provide Oversight. • Review of design, component selection, assurance inspections, fabrication, tests plans, test results and design documentation. • Review system preparations for launch operations. • Verify safety compliance in design concept during design and development phases • Verify safety compliance in design drawings during production • Verify safety compliance in procedural documents during the build-up and checkout of the hardware • Perform tailoring of safety requirements documents to optimize safety compliance efforts • Verify safety compliance during AIT activities by systematic review of hazardous procedures • Review safety documentation to assure major satellite contractors and instrument suppliers are in compliance with the safety requirements. • Provide recommendation to the Project Managers to sign the MSPSP if in compliance or advise on recommended changes. • Focal point for safety submittals. • Coordinate safety reviews and TIMS • Will conduct audits if needed

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Organization	Role	Responsibilities
NASA LaRC	Safety Manager	<ul style="list-style-type: none"> • Chairs the Safety Working Group • Provides Safety Payload inputs to be integrated in the MSPSP • Coordination and implementation of safety project plan during AIT at Ball Aerospace • Initiate and conduct safety analyses of the CALIPSO Payload and ground operations, including safety critical hardware, and ground support equipment.
CNES / ALCATEL	Safety Support	<ul style="list-style-type: none"> • Participate to the Safety Working Group • Provide Safety Platform inputs to be integrated in the MSPSP • Integrate the Missile System Pre-launch Safety Package (MSPSP) • Initiate and conduct safety analyses of the CALIPSO Platform and Spacecraft and ground operations, including safety- critical hardware, and ground support equipment. • Coordination and implementation of safety project plan during AIT at Alcatel
CNES NASA LaRC	CALIPSO Safety Engineers	<ul style="list-style-type: none"> • Participate in design reviews, technical interchange meetings, VAFB safety integration meetings, launch safety meetings • In charge of the satellite safety implementation at VAFB • Points of contact for launch and range safety aspects
NASA KSC	Launch Site Integration Manager (LSIM) and Safety Support	<ul style="list-style-type: none"> • Participate to the Safety Working Group • Supports CALIPSO Safety Engineers with the Range Safety requirements • Assist CALIPSO Safety Engineers interface with Range relationships
BATC	Product Assurance Manager/Safety Support	<ul style="list-style-type: none"> • Develop Lidar and WFC safety plan (instrument) • Laser safety • Provide safety support during instrument-to-payload integration, launch vehicle integration support, spacecraft/launch vehicle integration and launch operations • NASA /BATC shall provide safety support during instrument testing in ALCATEL

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Organization	Role	Responsibilities
		<ul style="list-style-type: none">• Safety representative shall participate in Safety Working Group
30th SPW	Range Safety	<ul style="list-style-type: none">• Participate to the Safety Working Group• Reviews data submittals and provides a recommendation to the SPW Commander regarding whether the risk associated with the spacecraft is acceptable for processing and launch from the Western Range

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3.2 SAFETY PROGRAM MILESTONES AND DELIVERABLES CHECKLIST

CALIPSO Safety Program milestones are the following:

- 1) Tailoring of the EWR 127-1 requirements by CNES and/or their contractors for the S/C and NASA and CNES and/or their contractors for the instruments. (to be reviewed by LaRC and GSFC, comment integrated, then sent to the Range by LaRC) (Tailoring will be done to the EWR 127-1 (31 October 1997) for changes to the PROTEUS Platform and its GSE, and the Payload/Laser and its GSE) - (L-20 months)
- 2) BATC and CNES each provide preliminary instrument MSPSP safety input -(L-13.5 months)
- 3) CNES/LaRC provide preliminary MSPSP to the Safety Working Group, with CNES' and BATC's instrument input, for review -(L-13 months)
- 4) Comments from the Safety Working Group are integrated into the MSPSP by CNES. -(L-12.5 months)
- 5) After the document is signed by CNES, ALCATEL and LaRC, LaRC sends the MSPSP to the Range-(L-12 months)
- 6) Preliminary MSPSP briefing to the Range supported by CNES/contractors, BATC, and LARC - (L-11 months)
- 7) BATC and CNES each provide final instrument MSPSP safety input to the Safety Working Group (L-7.5 mo)
- 8) CNES/ALCATEL provide final MSPSP to the Safety Working Group, with instrument (BATC and CNES) analyses attached as an appendix, for Safety Working Group review and approval -(L-7 mo)
- 9) Agreed upon comments are integrated into the final MSPSP by CNES. -(L-6.5 mo)
- 10) After the document is signed by CNES, ALCATEL and LaRC, LaRC sends the final MSPSP to the Range -(L-6 mo)
- 11) Final MSPSP briefing to the Range supported by the Safety Working Group (L-5 mo)

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- 12) LaRC/CNES maintains tracking of the Verification Tracking Log (VTL) (Periodic Submittals starting when the MSPSP is submitted to the Range at L- 5 mo. and ending when all remaining items are closed, approximately L-1 mo.) (?)
- 13) All hazardous procedures reviewed by safety from the organization that develops the procedures. The Safety Working Group reviews all hazardous procedures of hazardous operations at VAFB. LaRC will forward to the Range after LaRC signs the procedures.– (L –3.5 mo)
- 14) Maintain required training records (e.g. ESD, clean room, crane, etc.) Each organization maintains records for their employees (e.g. BATC Safety for BATC Personnel, ALCATEL for ALCATEL Personnel, etc.) Provide records to the Range – On going. Provide to the Range at arrival.
- 15) BATC and CNES each provide forms as required for their instruments. ALCATEL provides forms as required for the S/C. LaRC provides to the Range as required.
 - A. Radio Frequency Authorization Forms (RFA)
 - B. Provide Material Safety Data Sheets (MSDS) and Process Waste Questionnaires (PWQ)
 - C. Environmental Impact Statement Form
 - D. Laser- Non-ionizing

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3.3 LARC

3.3.1 LaRC Project Manager

CALIPSO safety is the ultimate responsibility of the LaRC CALIPSO Project Manager. The LaRC CALIPSO Project Manager's responsibility is to establish, control, direct, and implement program safety policies and requirements. This assures that accident risks are identified and eliminated or controlled to an acceptable level for the life of the CALIPSO Project for personnel and hardware. The Project Manager is also responsible for assuring that CNES and its team partner ALCATEL, SODERN, and BATC are in compliance with the overall CALIPSO Project Safety Program requirements. The Project Manager will implement these responsibilities through an identified CALIPSO safety team.

The LaRC and CNES Project Managers and LaRC, CNES and ALCATEL safety engineers review, approve, and sign the MSPSP, hazard reports, non-compliances, and other safety documentation.

3.3.2 LaRC Safety Support

The LaRC Safety Support will be responsible for directing the CALIPSO Safety Steering Working Group.

LaRC and CNES Safety Engineers have direct responsibility for operations safety during satellite processing at VAFB Processing Facility.

As part of the launch approval process, LaRC shall prepare a safety certification letter for the mission.

3.4 CNES

3.4.1 CNES Safety Support

CNES safety support will supply the MSPSP to the Safety Working Group

LaRC and CNES Safety Engineers have direct responsibility for operations safety during satellite processing at VAFB Processing Facility.

The LaRC and CNES Project Managers and LaRC, CNES and ALCATEL safety engineers review, approve, and sign the MSPSP, hazard reports, non-compliances, and other safety documentation

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3.4.2 Alcatel Safety Support

ALCATEL has direct responsibility for operations safety during satellite integration at ALCATEL

3.5 BATC

BATC is responsible for I&T instrument operations during instrument-to-payload integration, launch vehicle integration support, spacecraft/launch vehicle integration and launch operations as well as science data downlink.

BATC has direct responsibility for operations safety during payload integration at BATC. BATC is responsible for developing the MSPSP instrument inputs and instrument hazard analyses. The CNES Safety Manager will support BATC as required in identifying instrument hazard controls associated with CALIPSO spacecraft, the mechanical and electrical interface with the launch vehicle, and the integrated ground and launch operations.

3.6 SPACECRAFT AND INSTRUMENT CONTRACTORS

Spacecraft and instrument subcontractors involved in the development and testing of hazardous subsystems will provide a system safety analysis (MSPSP) in support of the overall safety deliverables detailed in this Safety Plan. The safety analysis will meet EWR 127-1 requirements. In addition, the subcontractors will provide certification that the supplied components comply with the established safety requirements for that component. Langley Safety will be responsible for identifying specific safety deliverables and coordinating safety-related matters with the subcontractors.

The CNES Safety Manager/ALCATEL will be responsible for performing safety analyses of the spacecraft critical subsystems as required, including, for example the battery, RF antennas, mechanisms, hydrazine propulsion, thermal heaters, lasers, lifting and handling, and ordnances. Subcontractors may be required to provide information on subsystems to complete these analyses.

3.7 INSTRUMENT SUPPLIERS

Instrument suppliers will provide system documentation, detailed information, and drawings, so that a safety analysis can be prepared to support the deliverables detailed in this Safety Plan. All suppliers will provide certification that the supplied instruments meet the established safety requirements for that instrument. Langley Safety will be responsible for identifying specific safety deliverables and coordinating safety related matters with the instrument supplier.

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3.8 30TH SPW

The range safety requirements prescribed by the 30th SPW in EWR-127-1 define the design and operational safety requirements applicable to the entire launch vehicle including the CALIPSO spacecraft. To assure the safety of the base and the general public, the range safety responsibility of the 30th SPW includes pre-launch operations and extends through the ascent phase up to CALIPSO spacecraft orbit insertion. The SPW Safety Office supports this role by interpreting safety requirements and identifying data submittals necessary for safety approvals. The SPW Safety Office reviews CALIPSO data submittals and provides a recommendation to the SPW Commander regarding whether the risk associated with the spacecraft is acceptable for processing and launch from the Western Range.

CNES will comply with the design and operational criteria in EWR-127-1 in assuring the safety of the CALIPSO spacecraft during spacecraft processing and launch operations through the ascent phase. The CNES Safety Manager is responsible for preparing the EWR-127-1 data submittals, which include the Preliminary and Final MSPSP.

4 REVIEWS

The Mission Assurance Manager and CALIPSO Safety Engineers will participate in CALIPSO Design Reviews, subsystems meetings, and readiness reviews, as well as the Ground Safety Review Board.

The CALIPSO Safety Engineers will actively participate at Safety meetings with BATC, USAF and NASA (Concept briefing, EWR 127.1 Tailoring...), as well as the review of the Range Safety Package (MSPSP).

5 SAFETY APPROVAL PROCESS

The MSPSP will also include the instrument safety analyses provided by the instrument suppliers/contractors CNES, NASA (LaRC), and BATC. The MSPSP will also include the Launch Site Ground Support Equipment and Ground Operations Overview for both the instruments and the spacecraft. CNES will provide the MSPSP to the Safety Working Group. After the MSPSP is reviewed, approved, and signed, the Safety Working Group transmits it to NASA/KSC LSIM. NASA/KSC LSIM will transmit the MSPSP to Range Safety for safety review and approval.

Necessary data will be provided to confirm compliance with the applicable safety requirements and concurrence with hazard analysis results.

Range Safety approval is also required for documentation such as the Ground Operation Plan and Hazardous procedures, as well as attendance at relevant meetings. The ALCATEL/CNES Safety support performing these analyses and developing these documents will provide them to the Safety Working Group. The Safety Working Group will then transmit

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these documents and analyses to NASA/KSC LSIM who will have Range Safety review and approve them.

5.1 SAFETY DATA

The following safety documents or data will be provided to Range Safety by the Safety Working Group in accordance with the CALIPSO project timeline, to verify compliance with the safety requirements for spacecraft, ground support equipment and ground operations at the Vandenberg launch site :

- Project Safety Plan (This document).
- EWR 127.1 Tailored: A tailored version of the EWR 127.1, to identify and tailor Safety requirements only applicable to CALIPSO Project (started after concept definition).
- Missile System Pre-launch Safety Package (MSPSP) inputs, including safety analysis (for the spacecraft, the Launch Site Ground Support Equipment and ground operations), test reports, hazardous launch site procedures, and personnel certification for hazardous operations (Initial due 12 months prior to launch, Final due 6 months prior to launch).
- Verification Tracking Log and Verifications

5.2 SAFETY DATA SUBMITTAL

The Safety Working Group provides the MSPSP to NASA/KSC LSIM. The NASA/KSC LSIM delivers the Missile System Pre-launch Safety Package (MSPSP) to the Range. This document is required for safety approval of the spacecraft design, tests, launch and ground operation activities.

The Safety Data Package summarizes the system safety analyses for the spacecraft and includes analysis of the spacecraft to launch vehicle interface. The MSPSP also includes information concerning all hazardous tasks accomplished during payload processing. ALCATEL Safety Engineer supports CNES Safety Manager during the Safety Working Group and Technical Interchange Meetings that are held to ensure exchange of the safety data necessary to verify compliance with range safety requirements.

The 30th Space Wing of Vandenberg Air Force Base formally approves the MSPSP.

5.3 SAFETY WAIVER/DEVIATION

Non-conformance with respect to USAF safety requirements, having safety impact, will be identified and addressed by preparation of a deviation/waiver request. Request for deviations and waivers to USAF requirements will be submitted through the CALIPSO Safety Working

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Group to the cognizant safety organization. Data specified by EWR-127-1 will be submitted by the CALIPSO Safety Working Group and forwarded to range authority for approval of the non-conformance.

All waivers and deviation having a safety impact will be referenced in the CALIPSO Safety Analysis, MSPSP, and addressed in the safety approval process for ground operations, and launch readiness review.

6 HAZARD ANALYSIS

Hazard analysis identifies potential hazards associated with spacecraft element operations or interfaces. It is developed in the process of developing the MSPSP and states explicitly the methods used for the elimination and/or control of hazards. The Spacecraft and instrument contractors will provide this analysis. EWR 127-1 Eastern and Western Range Regulation, is used during hazard analyses activities. The results of the analyses will be documented on hazard report forms (refer to Appendix C).

6.1 HAZARD IDENTIFICATION TECHNIQUES

The hazard identification process for the spacecraft consists of a series of analyses, each in itself performing a step in the overall identification process. These analyses are performed at the element level, element interface level, and finally combined spacecraft level.

6.1.1 Element Analyses

The hazard identification process for the spacecraft and GSE begins early in the project by performing hazard identification activities on each individual element as a portion of the hardware design solutions. The data from element analyses provides a firm basis for preliminary hazard identification.

6.1.2 Element Interface Analyses

This group of analyses considers the element interfaces and inherent characteristics of the design solutions to spacecraft and GSE functions. The element interfaces functional analysis considers each physical interface between elements by reviewing those functions that occur across these interfaces. That analysis examines each function from a logical stimulus to its desired response. The analyses extend from the source to the end-use of the signal and include all possible feed back paths. These functional analyses also examine the system-level consequences of functional interruption, making maximum use of the previously discussed element studies from other spacecraft.

6.1.3 Combined Spacecraft Analyses

This type of analyses is a "top down" hazard analysis because it examines the combined spacecraft for causes of undesirable consequences such a fire, over pressurization, etc. The top down analysis, in addition to examining nominal environments, looks for contributing

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factors from configuration within each spacecraft area and zone under study. For example, the most adverse consequence of a first order failure will be postulated to have occurred. Then the interaction and/or cumulative effect between elements for normal functions is examined.

6.2 GROUND PHASE HAZARD ANALYSIS

The final spacecraft hazard identification technique is a composite of all previous hazard identification efforts but adds those portions of hazards that can only be well defined late in the project, when the detailed operational sequences are developed.

For each event, the analytical process explores those factors that could result in the event occurring prematurely, failing to occur, occurring out of sequence and several other postulated off-nominal occurrences. Each of these will be then scrutinized by a team of specialists to discern any elements of hazard associated with the event. The team utilizes several discipline representatives.

7 ASSEMBLY, INTEGRATION AND TEST OPERATIONS

Assembly, integration and test (AIT) will be implemented for testing flight hardware prior to integration with the launch vehicle. The spacecraft will be assembled and submitted to acceptance testing before shipment to the launch site. The GSE components will be acceptance tested at the launch site.

Launch site checkout operations include system testing of both the satellite and GSE individually and finally integrated system testing.

During the AIT operations, the safety functions, consisting of system safety and occupational (Industrial) safety, maintain an active role in the manner described below. The two safety functions complement each other to provide safety in design and safety in operations.

7.1 SAFETY REVIEWS, TEST PLANNING AND DATA

Product Assurance from LaRC will review test documentation to ensure that test procedures directing hazardous operations reflect conformance to safety requirements for the protection of personnel, facilities, and equipment, and to minimize the hazards associated with the conduct of the test.

System Safety will review test results to determine any anomalous conditions that impact the safety of the design under consideration and to assure compliance with safety criteria.

7.2 SAFETY REVIEW OF PROCEDURES

Project safety personnel at the launch site will work closely with operations personnel in the development of procedures, which are used for the pre-launch integration and checkout of

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the systems. LARC and GSFC Safety Support will review those procedures containing hazardous operations. In addition, those procedures will also be reviewed and approved by the Range Safety Office.

Hazardous Procedures that are generated for I&T will be the responsibility of the I&T Facility Safety.

8 OCCUPATIONAL SAFETY

The occupational safety element of CALIPSO Project encompasses operations at the launch site, spacecraft and instrument provider sites, and spacecraft integration site. All operations occurring in the United States must meet OSHA, EPA, and NASA requirements for occupational safety. In general, the following activities reflect the occupational safety effort:

- Quality assurance implements safety requirements including applicable regulatory standards for occupational safety and health of employees
- Planning documents are reviewed to determine regulatory and safety implications
- Safety-operating procedures governing potentially hazardous operations will be generated
- Procedures related to hazardous operations will be approved
- Safety surveillance and inspections of activities, facilities and equipment will be performed to ensure compliance with safety requirements
- Safety surveillance and inspections of activities, facilities and equipment will be performed to detect unsafe conditions or practices with follow-up corrective action where indicated

9 TRAINING

Personnel training and certification is required of all personnel assigned to hazardous operations. CALIPSO Project Safety Manager will verify that tests, operations, and field support personnel who require proficiency training and certification for hazardous operations such as pyrotechnic connection and propellant fueling, possess current certification. Certification training records will be maintained by each organization.

10 AUDIT PROGRAM

The Safety Working Group will conduct safety audits as needed during different integration phases. Quality assurance and safety audit will include inspection of the GSE and the flight hardware and associated certification records. Meeting with spacecraft subcontractors or instrument manufacturers will be conducted by CALIPSO Project Safety personnel, whenever necessary, for clarification or to obtain proper interpretation of safety data. Safety audits, as needed, at ALCATEL will be performed by CNES/SAFETY authority.

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11 MISHAP REPORTING PROCESS

In the event of an accident or incident involving the CALIPSO spacecraft, its components, or interfaces, an investigation will be conducted by Mission Safety Personnel in accordance with NASA Mishap Reporting and Investigating Policy NPD 8621.1G found at URL http://nodis3.gsfc.nasa.gov/library/main_lib.html. A mishap investigation report will be prepared to determine the corrective action required to prevent the mishap from recurring. Reports will be made to the CALIPSO Project Managers and the GSFC CALIPSO Mission Manager. Mishaps occurring at VAFB controlled areas must be reported to the VAFB Safety Office and are subject to their investigation.

At ALCATEL facilities ALCATEL standards will be applied.

Spacecraft contractors and instrument manufacturers will investigate all mishaps resulting in injury, damage to the spacecraft or its components in accordance with their own internal procedures and provide a written mishap report to the CALIPSO LaRC and CNES Project Managers directly or via CNES if at CNES contracted facility. The mishap report will address the circumstances of the mishap, the probable cause, and corrective actions taken or planned. Mishaps to be reported will include, but not be limited to, damage to personnel, government and public property, the space environment, and space-based assets.

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APPENDIX A - ACRONYMS

ACRONYMS	DEFINITIONS
AFB	Air Force Base
AIT	Assembly Integration and Test
AO	Announcement of Opportunity
BATC	Ball Aerospace and Technologies Corporation
CDR	Critical Design Review
CNES	Centre National d'Etudes Spatiales
ESSP	Earth System Science Pathfinder
EGSE	Electrical Ground Support Equipment
EPA	Environmental Protection Agency
EOS PM	Earth Orbiting Satellite PM
EWR	Eastern Western Regulation
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
I/F	Interface
JSG	Joint Steering Group
KHB	Kennedy Handbook
KSC	Kennedy Space Center
LaRC	Langley Research Center
LSIM	Launch Site Integration Manager
MAM	Mission Assurance Manager
MGSE	Mechanical Ground Support Equipment
MSPSP	Missile System Pre-launch Safety Package
NASA	National Aeronautics and Space Administration
OSHA	Occupational Safety & Health Administration
PDR	Preliminary Design Review
PROTEUS	Plate-forme Réutilisable pour l'Observation de la Terre Et les Utilisations Scientifiques
RF	Radio Frequency
RFD	Request For Deviation
RFW	Request For Waiver
SCC	Satellite Control Center
SPW	Space Wing

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SWT	Science Working Team
TBC	To Be Confirmed
TBD	To Be Defined
USAF	United State Air Force
VAFB	Vandenberg Air Force Base
VTL	Verification Tracking Log

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APPENDIX B - DEFINITIONS

- **Satellite:**
launcher
The satellite includes a platform based on the PROTEUS definition, a payload instrument module, the payload instruments, and the adapter.
- **Platform:**
The PROTEUS platform includes the support functions for on-orbit operations, including provisions of electrical power, command, data handling and storage, telecommunications, thermal control, propulsion, and primary structure.
- **Payload:**
Supports the CALIPSO payload instruments and provides the required functions (thermal, mechanical..) and interfaces (harness, data bus..)
- **Payload Instruments:**
The various CALIPSO payload instruments with their internal interfaces.
- **Instrument Contractor:**
Company in charge of the development of an instrument
- **Instrument Supplier:**
CNES and Ball Aerospace & Technologies Corporation (BATC)
- **Satellite Supplier:**
CNES
- **Satellite Contractor:**
ALCATEL
- **Launcher Supplier:**
NASA
- **Launch Provider:**
Boeing

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APPENDIX C - HAZARD REPORT FORMS

PAYLOAD HAZARD REPORT		N° :	
PAYLOAD :		SAFETY PHASE :	
SUBSYSTEM :	HAZARD GROUP :	DATE :	
HAZARD TITLE :			
APPLICABLE SAFETY REQUIREMENTS :		HAZARD CATEGORY:	
			CATASTROPHIC
			CRITICAL
DESCRIPTION OF HAZARD :			
HAZARD CAUSES :			
HAZARD CONTROLS :			
SAFETY VERIFICATION METHODS :			
STATUS OF VERIFICATION :			
TECHNICAL DESCRIPTION AGREEMENT :			
SUBSYSTEM	NAME	SIGNATURE	DATE

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ANNEX TO :			HAZARD TITLE :		
HAZARD CAUSE :					
HAZARD CONTROLS :		SAFETY VERIFICATION METHODS :		VERIFICATION STATUS :	

- PAYLOAD HAZARD REPORT FORM # 2-